DIAGNOSING THE NATURE OF LAND-ATMOSPHERE COUPLING DURING THE 2006-7 DRY/WET EXTREMES IN THE U. S. SOUTHERN GREAT PLAINS

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Land-atmosphere interactions play a critical role in determining the diurnal evolution of both planetary boundary layer (PBL) and land surface temperature and moisture states. The degree of coupling between the land surface and PBL in numerical weather prediction and climate models remains largely unexplored and undiagnosed due to the complex interactions and feedbacks present across a range of scales. Further, uncoupled systems or experiments (e.g., the Project for Intercomparison of Land Parameterization Schemes, PILPS) may lead to inaccurate water and energy cycle process understanding by neglecting feedback processes such as PBL-top entrainment. In this study, a framework for diagnosing local land-atmosphere coupling (LoCo) is presented using a coupled mesoscale model with a suite of PBL and land surface model (LSM) options along with observations during the summers of 2006/7 in the U.S. Southern Great Plains. Specifically, the Weather Research and Forecasting (WRF) model has been coupled to NASA's Land Information System (LIS), which provides a flexible and high-resolution representation and initialization of land surface physics and states. A range of diagnostics exploring the links and feedbacks between soil moisture and precipitation are examined for the dry/wet extremes of this region, along with the sensitivity of PBL-LSM coupling to perturbations in soil moisture. As such, this methodology provides a potential pathway to study factors controlling local land-atmosphere coupling (LoCo) using the LIS-WRF system, which is serving as a testbed for LoCo experiments to evaluate coupling diagnostics within the community.